

B.Sc. DEGREE PROGRAMME
MATHEMATICS (CORE COURSE)
SIXTH SEMESTER

MM6B12 : NUMBER THEORY AND LINEAR ALGEBRA

5 hours/week

4 credits

30 weightage

Text Books:

1. David M. Burton : Elementary Number Theory, Sixth Edn., TMH.
2. Shanti Narayanan & Mittal : A Text Book of Matrices, Revised edn., S. Chand.

Module I – Theory of Numbers (30 hrs)

Divisibility theory in the integers – the division algorithm, the greatest common divisor, the Euclidean algorithm, the Diophantine equation $ax + by = c$.

Primes and their distribution. The fundamental theorem of arithmetic. The sieve of Eratosthenes. The theory of congruences. Basic properties of congruence. Binary and decimal representation of integers. Linear congruences and Chinese remainder theorem.

(Sections 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 4.2, 4.3 & 4.4 of Text 1).

Module II (25 hrs)

Fermat's little theorem and pseudoprimes Wilson's theorem. The sum and number of divisors. The greatest integer function. Euler's phi-function. Euler's generalization of Fermat's theorem. Properties of the phi-function.

(Sections 5.2, 5.3, 6.1, 6.3, 7.2, 7.3 and 7.4 of Text 1) (Theorems 7.6 and 7.7 only).

Module III (15 hrs)

Rank of a matrix – Elementary transformation, reduction to normal form, row reduced echelon form. Computing the inverse of a non singular matrix using elementary row transformation.

(Section 4.1 to 4.13 of Text 2)

Module IV (20 hrs)

System of linear homogeneous equations. Null space and nullity of matrix. Sylvester's law of nullity. Range of a matrix. Systems of linear non homogeneous equations.

Characteristic roots and characteristic vectors of a square matrix. Some fundamental theorem. Characteristic roots of Hermitian, Skew Hermitian and Unitary matrices. Characteristic equation of a matrix Cayley-Hamilton theorem.

(Sections 6.1 to 6.6 and 11.1 to 11.3 and 11.11).

References

1. C.Y. Hsiung : Elementary Theory of Numbers. Allied Publishers.
2. Neville Robbins : Beginning Number Theory, Second Ed. Narosa.
3. George E. Andrews : Number Theory, HPC.
4. Kenneth Hoffman & Ray Kunze : Linear Algebra, Pearson Education.
5. Frank Ayres, Jr. : Matrices, Schaum's Outline Series, Asian Student edition.
6. Devi Prasad : Elementary Linear Algebra, Narosa Pub. House.

Seminar Topic

Linear Transformation and Matrices.